IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	:	**Confirmation No. 4491**
Toshiyuki KAWAGUCHI et al.	:	Docket No. 2003_0407A
Serial No. 10/603,762	:	Group Art Unit 2832
Filed June 26, 2003	:	Examiner Marina Fishman

PUSH-BUTTON SWITCH MEMBER AND
MANUFACTURING METHOD OF SAME

DECLARATION UNDER 37 C.F.R. 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

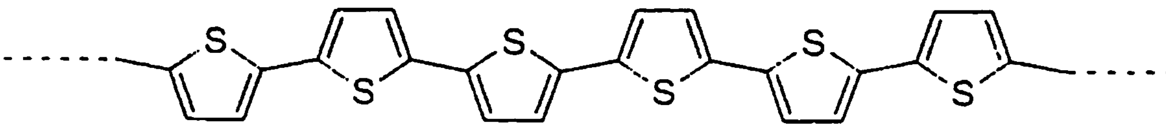
THE COMMISSIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEES FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

Sir:

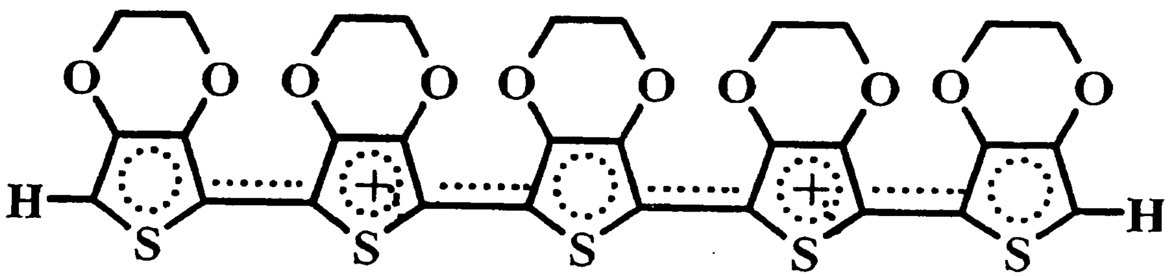
I, Dr. Yutaka HIGUCHI, the undersigned, a citizen of Japan, do hereby declare:

1. That I graduated from Akita University in 1996 with a Bachelor of Engineering in Applied Chemistry.
2. That I graduated from the Graduate school of Akita University in 1998 with a Master of Science in Applied Chemistry.
3. That I graduated from the Graduate school of Akita University in 2001 with a Doctor of Engineering in Applied Chemistry.
4. That I have been employed in the Research and Development Center of Shin-Etsu Polymer Co., Ltd., the Assignee of the above-identified application, since August of 2004 to research and develop conductive polymers.
5. That a list of the articles I have co-authored and previous work experience is attached.
6. That in order to show the novelty of the push-button switch member and the method of manufacturing the push-button switch member, as disclosed and claimed in the above-identified application, I offer the following scientific facts regarding why neither polyethylene nor polyethylene terephthalate can be considered to be a derivative of polythiophene.

The chemical structures of polythiophene (1), poly (3,4-ethylenedioxythiophene) (2), polyethylene (3), and polyethylene terephthalate (4) are shown below.

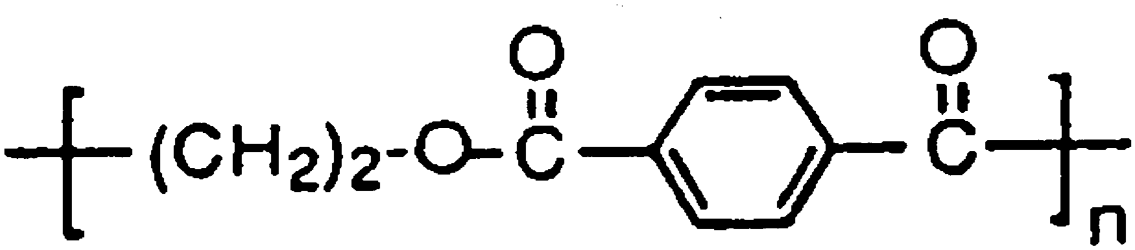


Polythiophene (1)



Poly (3,4-ethylenedioxythiophene) (2)

Polyethylene (3)



Polyethylene terephthalate (4)

Polythiophene (1) is a conductive polymer having the chemical structure shown above. See Attachment A (James E. Mark, Chapter 34, pages 453-454 and Figure 34.2, Physical Properties of Polymers Handbook, American Institute of Physics,1996).

Poly(3,4-ethylenedioxythiophene) (2), which is used in the examples of the present invention, is a derivative of polythiophene and is also a conductive polymer having the chemical structure shown above. See Attachment B (Yukio Kobayashi, pages 17-21, New Applications of Conducting Polymers, April 30, 2004, CMC Publications Co.) An English language translation of the above-referenced portions of Attachment B is provided.

Polyethylene (3) has the chemical structure shown above. See Attachment C (James E. Mark, Chapter 2, page 32, Physical Properties of Polymers Handbook, American Institute of Physics, 1996). Polyethylene (3) is a typical insulating material. See Attachment D (Noriyuki Kuramoto, page 18, Beginners Book 26, Conducting Polymers for Beginners, November 25, 2002, Kogyo Chosakai.) An English language translation of the above-referenced portions of Attachment D is provided.

Polyethylene terephthalate (4) (PET) has the chemical structure shown above. (See Attachment C, Chapter 2, page 32). Similar to polyethylene, polyethylene terephthalate is an insulating polymer.

In lines 1-2 on page 7 of the July 28, 2004 final Office Action, the Examiner asserts that Saito et al. (US 6,595,653), in Column 2, lines 50-59, "indicates that polyethylene is [a] polythiophene species conductive polymer." However, despite the Examiner's interpretation to the contrary, Saito et al. does not disclose that polyethylene is a species of polythiophene. Instead, Saito et al. discloses that the transparent conductive film 2 is not limited to vapor-depositing ITO (indium-tin oxide) on PET (polyethylene terephthalate). Alternatively, Saito et al. discloses that the transparent conductive film 2 may be a conductive polymer instead of vapor-depositing ITO on PET. If the transparent conductive film 2 is a conductive polymer, Saito discloses that a polythiophene species conductive polymer is preferable as the conductive polymer of the transparent conductive film 2. Saito et al. discloses that polyethylene dioxithiophene, not polyethylene, is preferred as the species of the polythiophene conductive polymer of the transparent conductive film 2 (see Column 2, lines 50-59).

Polyethylene dioxithiophene is a conductive polymer having the chemical structure of poly(3,4-ethylenedioxythiophene) (2) as shown above. That is, polyethylene dioxithiophene is equivalent to poly(3,4-ethylenedioxythiophene), which is often referred to as polyethylene dioxithiophene. Polyethylene dioxithiophene, or poly(3,4-ethylenedioxythiophene), and polythiophene each include sulfur (S) in their chemical structure as shown above. The sulfur element in polyethylene dioxithiophene, or poly(3,4-ethylenedioxythiophene), and polythiophene is represented by the suffix "thiophene." Thiophene is a unit of -C_4H_4S-, and polythiophene is composed of repeating units of -C_4H_4S-, that is, repeating units of thiophene.

As correctly described in Saito et al., polyethylene dioxithiophene, or poly(3,4-ethylenedioxythiophene), is a species of thiophene. Polyethylene dioxithiophene, however, is only a species of thiophene (polythiophene) because polyethylene dioxithiophene includes dioxithiophene.

Neither polyethylene nor polyethylene terephthalate (PET) include thiophene, and therefore, neither polyethylene nor PET can be considered to be a species of polythiophene.

Furthermore, for the reasons provided below, polyethylene cannot be considered to be a derivative of polythiophene.

Attachments E and F present dictionary definitions of the terms "derivative" from two representative technical dictionaries of chemistry which are published in Japan. The term "derivative" is defined in Attachment E (Kagaku Daijiten, Encylopedia Chimica, volume 9, page 361, September 10, 1978, Kyoritu Shuppan) as follows, where an English language translation of the definition is provided herein:

> **Derivative**: this term is mainly used in organic chemistry. A compound generated by a chemical change of a small portion in a certain original compound is called a derivative of the original compound. Normally, a compound whose hydrogen atom or specific atomic group is replaced by another atom or atomic group is called a derivative. For example, nitrobenzene $C_6H_5NO_2$ is a derivative of benzene C_6H_6, and acetyl chloride CH_3COCl is a derivative of acetic acid CH_3COOH. In a broad sense, a product which can be referred to as a derivative of the original compound can also be produced through an addition reaction. For example, the addition reaction between methyl iodide and tertiary amine produces a quaternary ammonium which is a derivative of the original compound, the tertiary amine. A molecular compound, as a derivative, can be produced by an addition

reaction between picric acid and a carbon hydride (hydrocarbon) such as naphthalene.

According to the above definition, even if polyethylene could be synthesized from polythiophene, "polyethylene" cannot be referred to as a derivative of "polythiophene," because polyethylene cannot be obtained without replacing "a main skeletal structure of polythiophene" or a "thiophene unit" with an "ethylene unit." Such a large scale skeletal replacement cannot be considered to be "a chemical change of a small portion in a certain original compound" according to the above definition of the term "derivative."

In addition, to date, it has proven to be impossible to synthesize polyethylene from polythiophene, and vice versa.

The term "derivative" is defined as follows in Attachment F (Encyclopedic Dictionary of Chemistry, page 2398, June 2001, Tokyo Kagaku Dojin), where an English language translation of the definition is provided herein:

> **Derivative**: this term is used in organic chemistry. A compound generated by a chemical change of a small portion in a certain original compound is called a derivative of the original compound. The term is mainly used for a substitution product but is sometimes used for an addition product. It is based on, in general, a compound or a hydrocarbon with a fewer number of atoms. For example, methyl chloride CH_3Cl can be called a derivative of methane CH_4, but in general, methyl chloride cannot be called a derivative of CH_3OH. In the case of ethyl acetate $C_2H_5OCOCH_3$, it is called a derivative of ethanol C_2H_5OH and it is also called a derivative of acetic acid CH_3COOH.

According to this latter definition of the term "derivative," even if polyethylene could be synthesized from polythiophene, "polyethylene" cannot be called a derivative of "polythiophene," because the "ethylene unit" in polyethylene has a fewer number of atoms than in the "thiophene unit" of polythiophene.

Furthermore, the Examiner asserts, on page 3 of the Office Action, that Tanabe discloses "polyethylene" as being a "transparent conductive polymer." Tanabe, however, does not identify "polyethylene" as being a "transparent conductive polymer." Instead, Tanabe discloses that a transparent electrode layer 4 is formed in a surface of "polyethylene terephthahlate (hereinafter PET)." Polyethylene terephthahlate is an insulating polymer, and is not a polyethylene, as can been seen from the chemical structure (4) show above.

CONCLUSION

For the reasons given above, I submit that neither polyethylene nor polyethylene terephthalate (PET) are either species of or derivatives of polythiophene.

I further declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statement may jeopardize the validity of this application or any patent issuing thereon.

Date: November 29, 2004

Dr. Yutaka Higuchi.

Dr. Yutaka HIGUCHI

Technical Background, Work Experience and Co-Authored Articles of Dr.Yutaka Higuchi

Education history

Doctor of Engineering in Applied Chemistry, April 1998 - March 2001

Graduate school of material engineering and applied chemistry, mining college, Akita Aniversity

Master of Science in Applied Chemistry, April 1996 - March 1998

Graduate school of material engineering and applied chemistry, mining college, Akita University

Bachelor of Engineering in Applied Chemistry, April 1992 - March 1996

Department of material engineering and applied chemistry, mining college, Akita University

Work Experience

August 2004 -

Shin-Etsu Polymer Co., Ltd. R&D Center

Responsible for research and development of a conductive polymer.

July 2003 - July 2004

Research Fellow at Venture Business Laboratory of Akita University

Responsible for synthesis and functional evaluation of a Thiacalixarene derivatives.

June 2003 - September 2003

Postdoctoral at Graduate school of faculty of engineering and resource science, Akita University

Responsible for synthesis and functional evaluation of a Thiacalixarene derivatives.

April 2001 - May 2003

NOF CORPORATION AITI Works JAPAN Research and Development Department

Responsible for composition examination, physical-properties evaluation, and raw-material composition of urethane.

Publications

Masaya Toda, Yosihiko Kondo, Tomohiro Niimi, **Yutaka Higuchi**, Ken Endo and Fumio Hamada, "SYNTHESIS OF FLUORESCENT MOLECULAR SENSORY SYSTEM FOR ENDCRINE DISRUPTORS BASED ON DANSYLTHIACALIX[6]ARENES" *Collect. Czech. Chem. Commun.* vol.69 1381-1394 (2004)

Chizuko Kabuto, **Yutaka Higuchi**, Tomohiro Niimi, Fumio Hamada, Nobuhiko Iki, Naoya Morohashi, and Sotaro Miyano, "Crystal Structure of Mono-, Di, and Tri(p-tert-butyl)-thiacalix[4]arenas: Dimeric Self-inclusion Behavior", *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 42, pp.89-98 (2002).

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Yutaka Higuchi, Miyuki Narita, Shinogu Sugawara, Nobuaki Ogawa, Fumio Hamada, and Hideo Suzuki, "Fluorescent Chiral Molecular Sensing Based on β-Cyclodextrins Modified Mono and Bis (R)- or (S)-3-Hydroxy-3-phenylpropanoic Acid", *Int. J. of the Soc. of Mat. Eng. for Resources*, **8**, 19-24 (2000).

Miyuki Narita, **Yutaka Higuchi**, Fumio Hmada, and Hitoshi Kumagai "Metal Sensor of Water Soluble Dansyl-modified Thiacalix[4]arenes", *Tetrahedron Lett.*, **39**, 8687 - 8690 (1998).

Fumio Hamada, Koutraou Hoshi, **Yutaka Higuchi**, Koichi Murai, Youichi Akagami, and Akihiko Ueno, "Photochemical molecular recognition of β-cyclodextrin bearing spiropyran moiety for organic guests", *J. Chem. Soc., Perkin Trans. 2*, 2567 - 2570 (1996).

Fumio Hamada, Koutraou Hoshi, **Yutaka Higuchi**, Koichi Murai, Youichi Akagami, and Akihiko Ueno, "Photochemical molecular recognition of β-cyclodextrin bearing spiropyran moiety for organic guests", *J. Chem. Soc., Perkin Trans. 2*, 2567 - 2570 (1996).

Fumio Hamada, Kyoko Ishikawa, **Yutaka Higuchi**, Youichi Akagami, and Akihiko Ueno, "Strong-Binding Between Acidic Guests and Fluorescein Modified γ-Cyclodextrin via Hydrogen Bonding", *J. Inclusion Phenom. Mol. Recognit. Chem.*, 25(4), 283 - 294 (1996).